PATENT ABSTRACTS OF JAPAN

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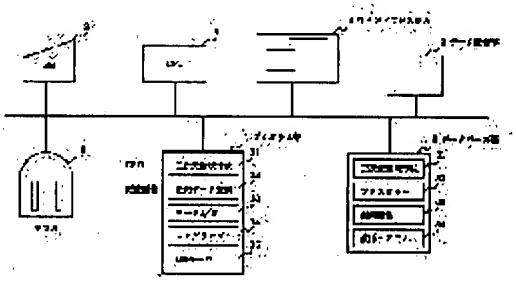
(54) THREE-DIMENSIONAL PICTURE PROCESSOR AND METHOD FOR THE SAME

(57)Abstract:

PURPOSE: To attain the further real projection of a three-dimensional object by preparing the two-dimensional projected image of an object from three-dimensional geometric shape information and attribute information obtained as a retrieved result, and displaying the prepared two-dimensional projected image.

CONSTITUTION: A multiwindow system 6 displays a 3D geometric shape model, and interactively displays an instruction from a user. Also, the projected image of the three-dimensional geometric shape data to a two-dimensional plane can be prepared by a programming. In a program storage part 1, a program 11 prepares and edits the three-dimensional shape, a program 12 being a geometric data conversion program prepares each kind of 3D geometric data from an inputted distance picture, a program 13 being a user I/F program executes retrieval and the change of display or the like to each kind of 3d geometric shape or geometric attribute existing in a data base 3, and a rendering display program 14 displays the three-dimensional information according to the retrieved geometric shape and geometric attribute.



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CLAIMS

[Claim(s)]
[Claim 1] An input means to input the three-dimension geometry configuration information and attribute information on objective, and a storing means to store the three-dimension geometry configuration information and attribute information that it was inputted from this input means, Using the three-dimension geometry configuration information and attribute information which were acquired as a retrieval result by retrieval information input means to input retrieval information, retrieval means to search said storing means based on the retrieval information inputted from this retrieval information input means, and this retrieval means The three-dimension image processing system characterized by having a creation means to create an objective two-dimensional projection image, and the display-control means on which the two-dimensional projection image created by this creation means is displayed.
[Claim 2] The three-dimension image processing system according to claim 1 characterized by having a means by which said input means inputs the profile set as the axial object of body of revolution.
[Claim 3] The three-dimension image processing system according to claim 1 characterized by equipping said input means with a depth map input means to input a depth map, and a generation means to generate three-dimension geometry configuration information from a depth map.
[Claim 4] The input process which inputs the three-dimension geometry configuration information and attribute information on objective, and the storing process which stores in a database the three-dimension geometry configuration information and attribute information that it was inputted from this input process, The retrieval information input process of inputting retrieval information, and the search procedure which searches said database based on the retrieval information inputted according to this retrieval information input process, The three-dimension image-processing approach characterized by having the creation process which creates an objective two-dimensional projection image using the three-dimension geometry configuration information and attribute information which were acquired as a retrieval result by this search procedure, and the display process on which the two-dimensional projection image created by this creation process is displayed.
[Claim 5] The three-dimension image-processing approach according to claim 4 characterized by having the process which inputs the profile from which said input process is set as the axial object of body of revolution.
[Claim 6] The three-dimension image-processing approach according to claim 4 characterized by equipping said input process with the depth map input process of inputting a depth map, and the generation process which generates three-dimension geometry configuration information from a depth map.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] In case this invention chooses a desired body by various kinds of data retrievals with a lot of similar data, it utilizes three-dimensions geometry data and relates to the +3-dimensional electronic 2-dimensional catalog which can present more real information and a more real scene compared with the case of the retrieval using 2-dimensional information.
[0002]
[Description of the Prior Art] Conventionally, the formation of low-pricing + large capacity of the secondary storage of various large capacity, the spread of the window systems in which color display is possible, and the system with which a desired image is searched are beginning to be further used by progress of a database (DB) technique from a lot of high definition images.
[0003] In case a user searches a desired image with the above-mentioned conventional system, the characteristic quantity which is inherent in the keyword attached to an image or an image is calculated, it is made into a key, and a search is performed.
[0004]
[Problem(s) to be Solved by the Invention] However, in the conventional example, when the image searched needs the body image which projected the body on the 2-dimensional flat surface, and looked at it from the view which differs by the ability doing, these images must be memorized, respectively and much storage capacity is needed. Although the advanced picture compression algorithm is developed recently, it becomes expensive [in respect of retrieval speed] also in capacity.
[0005] Moreover, the pattern on each front face of a body can be changed, or it cannot arrange, combining two or more searched bodies in three dimensions, and actuation of looking at the combined image cannot be realized by DB by 2-dimensional data. Moreover, in DB of a 2-dimensional image, it is also very difficult to look at the situation of actuation [**** / making a body transform with reality].
[0006] On the other hand, in three-dimensions configuration data base construction, a difficulty is in creation of a three-dimensions geometric model, and there is a trouble that the amateur of CAD cannot input a three-dimensions configuration easily like the DTP system which is two dimensions. Therefore, construction of three dimensions DB was difficult.
[0007]
[Means for Solving the Problem] An input means to input the three-dimension geometry configuration information and attribute information on objective into a three-dimension image processing system in this invention in order to solve the above-mentioned technical problem, A storing means to store the three-dimension geometry configuration information and attribute information that it was inputted from this input means, Using the three-dimension geometry configuration information and attribute information which were acquired as a retrieval result by retrieval information input means to input retrieval information, retrieval means to search said storing means based on the retrieval information inputted from this retrieval information input means, and this retrieval means It has a creation means to create an objective two-dimensional projection image, and the display-control means on which the two-

dimensional projection image created by this creation means is displayed.
[0008]
[Function] The three-dimension geometry configuration information and the attribute information were inputted from an input means store in a storing means, said storing means searches with a retrieval means based on input ****** retrieval information from a retrieval information input means, a creation means creates an objective two-dimensional projection image using the three-dimension geometry configuration information and the attribute information acquired as a retrieval result, and, according to this invention, the created two-dimensional projection image displays with a display-control means.
[0009]
[Example] In the following examples, the following various displays of the body searched based on the description or keyword of a geometric configuration are attained by using the technique of CG.
[0010] - Apply various beams of light to a body, and display the projection image to the screen side by rotation and migration, and view modification of a body on three-dimensions space.
[0011] - Display the projection image which creates various imagination bodies and has a different feeling of the quality of the material by changing the special feature of an objective front face, especially a texture.
[0012] - Create the projection image by the combination of the searched body by offering an edit means to arrange each searched body on three-dimensions space.
[0013] - By performing migration and rotation, and deformation for a body, interpolate these change and perform an animation display.
[0014] As an input means to DB of a geometric body, it realizes using the two-way-type type described below. One side is the technique of the amateur sense in which it is not used to a three-dimensions input, and another side is considered to be the technique of the man sense in which it got used to the input of a three-dimensions body.
[0015] - Create semi-automatically the polygon patch and free sculptured surface by segmentation by specifying a parameter from the measurement result using the distance robot to a real object.
[0016] - The method which defines an objective profile by the CAD system or the 2-dimensional flat surface, and inputs the three-dimensions configuration by rotation.
[0017] Moreover, in order to DB-ize three-dimensions configuration data, it becomes possible from one configuration data to create various configuration data easily especially here by giving a global deformation parameter rather than editing locally the three-dimensions information designed once.
[0018] Hereafter, the example by this invention is explained to a detail according to an accompanying drawing. Drawing 1 is the system chart showing the basic configuration of the "three-dimensions electronic catalog equipment" which is the example of this invention.
[0019] In this drawing, the data storage section for the program store section for 1 to memorize this procedure and 2 to memorize information and a I / O data required for processing of this system, the database section in which 3 stores various mass retrieval data, and 4 are CPUs for processing according to the procedure memorized by the program store section 1.
[0020] 6 is a multi-window system which displays 3D geometry geometric model obtained by this system, or displays the directions from a user interactively. This windowing system is a system which can create the projection image to a 2-dimensional flat surface for three-dimensions geometry configuration data by programming like the PEX (PHIGS Extension to X) escape in the X Window System developed in MIT. 8 is a mouse which inputs the command from a user. 9 is a keyboard (KB), and a user creates a program or it is used for inputting a command into this system.
[0021] It sets in the program store section 1, 11 is a program which creates and edits a three-dimensions geometry configuration, and 12 is a geometric data-conversion program which generates various 3D geometry data to the inputted depth map. 13 is a user I/F program for performing modification of retrieval and a display etc. to various 3D geometry configurations and the geometric attribute which exist in a database 3.
[0022] 14 is a rendering display program which indicates the three-dimensions information by the rendering by various technique according to the searched geometric configuration + geometry attribute.

15 is DB server program for the retrieval based on the user I/F program 13 actually performing data retrieval generated, or registering data.
[0023] In the database section 3, the three-dimensions geometry configuration DB31 is a database which stores the three-dimensions geometry configuration used as the main data of this invention. The texture DB32 stores the pattern on the various front faces of a body used in the case of a three-dimensional display (texture). The geometric attribute PB33 stores the optical property of the objective front face for creating the projection image of a three-dimensions body. The objective deformation pattern is registered into DB in deformation and the animation pattern DB of 34, and actuation of a wish is displayed more simply.
[0024] In this example, the component engineering for creating an electronic catalog, creation of 3D configuration, DB-izing, retrieval and modification, and a display subsystem are explained, using tableware especially as a 3D body. Next, the example of the three-dimensions electronic catalog which combined these component engineerings is shown.
[0025] When creating DB, time amount is the required for the program which creates the creation three-dimensions configuration of a three-dimensions configuration, and also technically, an advanced technique is required.
[0026] Here, two technique shown below is prepared as an example of implementation, and it makes it possible to choose one of technique with the skill level to the special feature of an object object, a user's convenience, and a CAD system.
[0027] (1) Here where a three-dimensions geometric model is built from the beginning by CAD etc. explains the input technique for tableware, especially a body symmetrical with rotation like a pan using the flow chart of drawing 2 , and the example of creation of drawing 3 from the beginning.
[0028] As a procedure, the shaft 201 which takes the lead in rotational is first created at a 2-dimensional flat surface in step S101. What is necessary is just to set this as a Y-axis, in order to simplify future processings. Next, in order to create a body with a curve like a pan, body of revolution will be created for the configuration to rotate using a free form curve (for example, B-Spline and a Bezier function). Therefore, in step S102, the control point which determines a curve as only is inputted (a small round mark shows in drawing 3). If an object object does not have to carry out a curvilinear definition, the location of a profile will be inputted here.
[0029] Next, in step S103, the curve of the appearance of a rotation configuration is drawn and displayed and it judges whether it is that from which satisfaction to step S104 is obtained, and if it is O.K., although it progresses to the following step S105, the location of a control point will be changed at step S107, and a curve will be drawn again. Since repositioning processing of this control point is performed on a 2-dimensional flat surface, the technique of the curvilinear edit processing which the conventional DTP etc. is sufficient as and is used can be used.
[0030] A solid body is actually created by curved rotation, and a projection image is expressed as step S105. If it is not satisfactory with the curved surface done here, like the above-mentioned, at step S107, a quadratic curve will be edited and steps S103-S105 will be rerun.
[0031] If the three-dimensions configuration from which satisfaction is finally obtained is acquired, it is made the optimal data format for storing in DB at step S108, and stores in the three-dimensions geometry configuration 31.
[0032] A formula is used for below and the construction technique of the geometric configuration of a rotation body is briefly explained to it. The quadratic curve of body of revolution is first described in the following P (t).
[0033] P(t)=[T][N][G]
Here, when the Bezier curve of Miyoshi is taken for an example, [T] and [N] are the polynomials of bernstein shown below, and [G] is the coordinate value of each control point (four points) specified at step S102.
[0034]
[External Character 1]

$$[t^3\ t^2\ 1\ 1]\begin{bmatrix}-1 & 3 & -3 & 1\\ 3 & -6 & 3 & 0\\ -3 & 3 & 0 & 0\\ 1 & 0 & 0 & 0\end{bmatrix}$$

Here, a desired curve will be obtained if t is changed continuously in between (0-1). Although Bezier was taken for the example here, B-Spline can define a curve similarly. The three-dimensions coordinate of a final geometry body of step S105 (x y, z) is determined by the following formulas Q (t, phi).
[0035] Q(t, theta) =P(t) [S]
[S] is a matrix which shows the rotation factor centering on a Y-axis, and is shown below here. It is possible to control the amount of fragmentation to the polygon patch on the front face of a body by variation of theta here. In case a whole configuration is designed first, if make the amount of fragmentation coarse, it enables it to display on a high speed and a configuration becomes settled to some extent, the amount of fragmentation will be made fine and it will be made to design in a detail. The projection image of the pan of the three-dimensions body finally created is shown in drawing 4 .
[0036]
[External Character 2]

$$\begin{bmatrix}\cos\theta & 0 & \sin\theta & 0\\ 0 & 0 & 0 & 0\\ 0 & 1 & 0 & 0\\ 0 & 0 & 0 & 1\end{bmatrix}$$

[0037] (2) Changing into a three-dimensions geometric model from a depth map, to the above-mentioned technique to create being for [which became skilled in three-dimensions input software, such as CAD] pros, this technique inputs distance data with three-dimension metering devices, such as a range finder based on triangulation, the various methods, for example, the optical time-of-flight measuring method, of the three-dimensions distance input by non-contact, and creates a three-dimension geometric model from the obtained three-dimension data. The implementation approach is detailed to Japanese Patent Application No. No. 198655 [four to] for which these people applied previously.
[0038] In the above-mentioned application, the remarkable place of change of a normal was densely sampled as a fundamental algorithm using differential geometry, and the loose place of change has adopted the method which samples to a non-dense and generates a polygon patch.
[0039] the time of performing DB-ized DB-ization -- here -- current -- it is used widely -- relational -- it is premised on building using DB. And it explains how the schema of DB is created here. However, even if OODB (object-oriented DB) realizes this, there is no inconvenience. The whole outline configuration of DB in a three-dimensions electronic catalog is shown in drawing 5 .
[0040] Each element is explained briefly first and explanation is added to a detail after that. The object name 501, the creation date 502, and an implementer 503 are used in order to search easily by using such information as a key later, while they specify data. The following top-most-vertices information 504 and topology 505 are configuration data made by the three-dimensions configuration creation technique in which it explained for the preceding clause. Since it is used in common by various bodies (tableware) in many cases, the attribute information 506 is independently convenient as an attribute DB550 of the quality of the material, if a definition is given. 507 stores the three-dimensions description of geometric bodies, such as X, Y, and max, the minimum value of a Z coordinate. As the last key, the non-geometry information attached to a body and the physical information on a non-body, i.e., a price and a quotient lot number number, and the functional name etc are stored as other descriptions 508.
[0041] The information and three-dimensions geometry information which take the lead with Book DB first are explained. The configuration of a three-dimensions geometry body is surely defined by object frame, and if the attribute over a configuration can also be specified as option, it will be specified as coincidence. For example, the polygon geometry data obtained from the above-mentioned depth map are described like drawing 6 . It is roughly as data divided into two parts here, the geometric information on

the top-most vertices of a polygon is described the first half, and the topology of how to connect the top-most vertices of a polygon the second half is shown.

[0042] The top-most-vertices information on the first portion can specify the three-dimensions coordinate value of x, and (y, z) and the normal vector of (normal-x, normal-y, normal-z) as option information, and the color etc (r, g, b) of top-most vertices as top-most vertices as indispensable information. In this way, decision of the element of top-most-vertices information enumerates corresponding information for every top-most vertices.

[0043] In the second half, the topology of the section specifies the number of top-most vertices of the polygon which connects top-most vertices and can do them first, and specifies the index information for the above-mentioned top-most vertices some which forms a polygon next (the first positional information is set to index 1). These are the mandatory information of topology and it is also possible to extend DB so that the various attributes of a polygon may be specified as coincidence. Such various attribute information can also carry out the link price to another DB, as shown in drawing 5 .

[0044] Size is not fixed, but since this top-most vertices and topology are a variable-length data, they are good to hold the pointer to stereo data in DB.

[0045] For example, it is possible by a certain color space's (here R's, G's, B's) defining the objective color (gold, copper, gypsum fibrosum, plastics etc) 551 of various bodies, and turning separately the diffuse reflection multiplier 552 (0-1) and the specular reflection factor 553 (0-1) DB.

[0046] Such information is stored in the database section 3 according to the schema of DB.

[0047] Although various technique can be considered, searching the database of the three-dimensions relation by which retrieval / modification storing was carried out gives, in case index for making retrieval easy is DB-ized to various three-dimensions associated data as easiest technique.

[0048] As a result, retrieval of retrieval of three-dimensions related information is easily attained by the framework of SQL in the conventional RDB. Here, retrieval of geometric information including top-most-vertices information and geometric information is explained.

[0049] For example, supposing he wants to retrieve the three-dimensions geometry information on a pan that the price of tableware carried out the red color for 5,000 yen or more, the SQL-like retrieval sentence shown in drawing 7 will be published to the DB server 15, and DB will answer the geometric information corresponding to this condition through user I/F13. Although here is explaining using SQL, even if this is other object orientation DB, it is satisfactory.

[0050] If two or more bodies are chosen as a candidate as a result of retrieval, the body which divides a screen into some and has become each field with the candidate is displayed in three dimensions. A user makes display precision of a retrieval body controllable so that it displays only an objective ridgeline in case a user chooses it as a high speed at this time (wire frame display), and even a texture map may be given to a case, even if a user displays on a detail and spends many hours on retrieval.

[0051] As an example of a 3D display three-dimensional display, the graphics library of the windowing system in WS is used. Although this example explains PHIGS which is the international standards of ISO taking the case of PEX (PHIGS Extension toX) extended to the X Window System, the same effectiveness is acquired no matter what library it may use fundamentally.

[0052] A principle is explained briefly [parallel projection creation of a three-dimensions body] using drawing 8 . Each point of a three-dimensions body is projected on the projection flat surface (View Plane) VP 804 by projection Rhine 806 which connects the core PRP(ProjectionReference Point) 802 of VRP (View Reference Point)801 called a projective reference point or view and projection, and can do it, and parallel Rhine, and the three-dimensions body between FP (Front Plane)803 and BP (Back Plane) 805 creates a 2-dimensional image by them.

[0053] Fundamentally, since it provides with the gestalt which can use this projection processing from a high level language as API (Application Program Interface) in a windowing system in a three-dimensional display, it becomes a gestalt using it.

[0054] The projection algorithm using the graphics library is explained using the flow chart of drawing 9 . In step S901, a three-dimensions geometry configuration is first loaded from DB31. In this case, the system of coordinates which define 3D configuration are each system of coordinates (Modeling

Coordinate) which define the body, and especially these system of coordinates do not need to be unified.

[0055] Next, a camera parameter required to create a projection image after step S902 is determined. The view (VRP) 801 at the time of projecting first is decided. If a view becomes settled, in step S903, the projection core (PRP) 802 and the direction vectors u and v of a projective longitudinal plane of symmetry will also be specified. Consequently, it is decided that plane of projection (VP) 804 will be a meaning. Next, in order to determine which part is projected in three-dimensions space in step S904, view-volume to observe is defined by specifying a front face (FP) 803 and a rear face (BP) 805 focusing on VP. Consequently, only the body in the field shown in drawing 8 serves as a candidate for a display.
[0056] If a camera parameter is decided, a body will be changed into actually arranged WC (World Coordinate) from the modeling coordinate which defines a body by step S905 next. It realizes using migration of a body, rotation, and a scaling operation, and these are expressed by the matrix of 4x4.
[0057] In this way, if objective arrangement becomes settled, in step S906, various attributes will be set as the last that the simulation of the staining of a body should be carried out. Typical attributes are enumerated below.
[0058] - The reflection coefficient of the class (a point, a field, parallel, ambient light) of light source, the location of the light source, a direction, and a color and a field (a diffuse reflection multiplier, a specular reflection factor, and color)
- Carry out actual projection image creation to a field in the texture and step S907 of a proper. And it becomes possible by moving and rotating an objective location, or changing a camera parameter in step S909, and displaying a projection image again to create animation.
[0059] If there is a fixed pattern in the actuation which carries out also here and is displayed and they will be DB-ized, using them as the deformation + animation SHON information 34, the need of describing actuation procedurally will be lost. difference [in / for performance information / in / here / each coma / (migration, rotation, enlarging or contracting etc) / each scene] -- it stores as information.
[0060] In addition, even if it applies this invention to the system which consists of two or more devices, it may be applied to the equipment which consists of one device. Moreover, it cannot be overemphasized that it can apply when this invention can be attained by supplying a program to a system or equipment.
[0061]
[Effect of the Invention] Since the material change of construction in the difficult three-dimensions world, the projection image creation from various include angles, and a body can be performed by this invention in case retrieval is performed from the conventional electronic catalog, retrieval of three-dimensions bodies, such as goods in more real feeling, is attained.
[0062] Moreover, since various bodies are described in three dimensions, they become possible [using also for applications, such as animation,].

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TECHNICAL FIELD

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PRIOR ART

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

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[0005] Moreover, the pattern on each front face of a body can be changed, or it cannot arrange, combining two or more searched bodies in three dimensions, and actuation of looking at the combined image cannot be realized by DB by 2-dimensional data. Moreover, in DB of a 2-dimensional image, it is also very difficult to look at the situation of actuation [**** / making a body transform with reality].
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MEANS

[Means for Solving the Problem] An input means to input the three-dimension geometry configuration information and attribute information on objective into a three-dimension image processing system in this invention in order to solve the above-mentioned technical problem, A storing means to store the three-dimension geometry configuration information and attribute information that it was inputted from this input means, Using the three-dimension geometry configuration information and attribute information which were acquired as a retrieval result by retrieval information input means to input retrieval information, retrieval means to search said storing means based on the retrieval information inputted from this retrieval information input means, and this retrieval means It has a creation means to create an objective two-dimensional projection image, and the display-control means on which the two-dimensional projection image created by this creation means is displayed.

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OPERATION

[Function] The three-dimension geometry configuration information and the attribute information were inputted from an input means store in a storing means, said storing means searches with a retrieval means based on input ****** retrieval information from a retrieval information input means, a creation means creates an objective two-dimensional projection image using the three-dimension geometry configuration information and the attribute information acquired as a retrieval result, and, according to this invention, the created two-dimensional projection image displays with a display-control means.

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[0011] - Display the projection image which creates various imagination bodies and has a different feeling of the quality of the material by changing the special feature of an objective front face, especially a texture.
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[0013] - By performing migration and rotation, and deformation for a body, interpolate these change and perform an animation display.
[0014] As an input means to DB of a geometric body, it realizes using the two-way-type type described below. One side is the technique of the amateur sense in which it is not used to a three-dimensions input, and another side is considered to be the technique of the man sense in which it got used to the input of a three-dimensions body.
[0015] - Create semi-automatically the polygon patch and free sculptured surface by segmentation by specifying a parameter from the measurement result using the distance robot to a real object.
[0016] - The method which defines an objective profile by the CAD system or the 2-dimensional flat surface, and inputs the three-dimensions configuration by rotation.
[0017] Moreover, in order to DB-ize three-dimensions configuration data, it becomes possible from one configuration data to create various configuration data easily especially here by giving a global deformation parameter rather than editing locally the three-dimensions information designed once.
[0018] Hereafter, the example by this invention is explained to a detail according to an accompanying drawing. Drawing 1 is the system chart showing the basic configuration of the "three-dimensions electronic catalog equipment" which is the example of this invention.
[0019] In this drawing, the data storage section for the program store section for 1 to memorize this procedure and 2 to memorize information and a I / O data required for processing of this system, the database section in which 3 stores various mass retrieval data, and 4 are CPUs for processing according to the procedure memorized by the program store section 1.
[0020] 6 is a multi-window system which displays 3D geometry geometric model obtained by this system, or displays the directions from a user interactively. This windowing system is a system which can create the projection image to a 2-dimensional flat surface for three-dimensions geometry configuration data by programming like the PEX (PHIGS Extension to X) escape in the X Window System developed in MIT. 8 is a mouse which inputs the command from a user. 9 is a keyboard (KB), and a user creates a program or it is used for inputting a command into this system.
[0021] It sets in the program store section 1, 11 is a program which creates and edits a three-dimensions geometry configuration, and 12 is a geometric data-conversion program which generates various 3D geometry data to the inputted depth map. 13 is a user I/F program for performing modification of

retrieval and a display etc. to various 3D geometry configurations and the geometric attribute which exist in a database 3.
[0022] 14 is a rendering display program which indicates the three-dimensions information by the rendering by various technique according to the searched geometric configuration + geometry attribute.

* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the basic configuration of the three-dimensions electronic catalog equipment of this example.
[Drawing 2] It is the flow chart which shows the basic algorithm of body-of-revolution creation.
[Drawing 3] It is drawing showing the example of creation in the 2-dimensional space of a body-of-revolution body.
[Drawing 4] It is drawing showing the example of projection from the three-dimensions space of a body-of-revolution body.
[Drawing 5] It is the whole three-dimensions DB block diagram.
[Drawing 6] It is drawing showing the example of three-dimensions geometry data of a polygon.
[Drawing 7] It is drawing showing the example of an inquiry to three dimensions DB.
[Drawing 8] It is drawing showing the principle of three-dimensions projection.
[Drawing 9] It is drawing showing the projection algorithm of a three-dimensions body.
[Description of Notations]
1 Program Store Section
2 Data Storage Section
3 Database Section
4 CPU
6 Windowing System
8 Mouse
9 Keyboard
11 Three-Dimensions Geometric Model Creation Program
12 Geometric Data-Conversion Program
13 User I/F Program
14 Rendering Display Program
15 DB Server Program
31 Three-Dimensions Geometry Configuration DB
32 Texture DB
33 Geometric Attribute DB
34 Deformation and Animation Pattern DB

[Translation done.]